

General Practitioner Pre-Hospital Resuscitation Contribution to out of Hospital Cardiac Arrest Survival; A Retrospective Study

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ABSTRACT

Background: Out of hospital cardiac arrest survival remains low in most countries. No previous studies examined general practitioner (GP) pre-hospital resuscitation contribution to OHCA survival in the Middle East region. This study describes GP prehospital resuscitation and investigates its contribution to out of hospital cardiac arrest (OHCA) survival in pilot regions of Kuwait.

Method: A retrospective observational study using data from Emergency Medical Services (EMS) archived registry in Kuwait to describe GP prehospital resuscitation attempts in pilot regions of Kuwait (n=601) over 10 months period (21 February-31 December 2017) from Hawali and Al Farwanya provinces. We then compared OHCA demographics, resuscitation and outcomes during GP presence to those arrests from the community. Primary outcomes: survival to 30 days. Secondary outcome; return of spontaneous circulation (ROSC).

Results: A total of 601 out of OHCA events from Kuwait EMS archived data were extracted. Of these, 314 OHCA cases met the inclusion criteria. When GP on scene, OHCA patients were more likely to survive to 30 days 7% (p=0.029). However, in terms of prehospital ROSC, no significant change was noted 7% (p=0.191).

“GP present group” were more likely to be witnessed 55% (p ≤ 0.001), receive early CPR 48% (p ≤ 0.001) and defibrillation 4% (p ≤ 0.001).

Conclusion: In summary, general practitioner pre-hospital resuscitation can enhance OHCA survival to 30 days in regions of Kuwait. We propose expansion to other regions and building GP prehospital resuscitation database to improve OHCA survival.

Keywords: Cardiac arrest; Survival; General Practitioner; Resuscitation

INTRODUCTION

Out of hospital cardiac arrest is an internationally challenging health condition with a variable survival rates [1]. Global resuscitation alliance continues to emphasize ‘Chain of survival’ strategy to improve OHCA outcomes. Where early access, early CPR, early defibrillation, early advanced care are the most critical elements [2].

General practitioners (GP) have an important role in the management of OHCA [3]. OHCA do occur in primary care clinics and GPs often encounter OHCA resuscitation during their patient care [4]. GPs involvement in OHCA resuscitation

provides early access, early CPR and early defibrillation. This recorded favourable OHCA survival rates (17-27%) [5,6].

However, local GP contributions to OHCA outcomes have not been studied previously. Primary care clinics are located in each residential area only five minutes away from people’s homes. About 97% of the population use primary care clinics and 3% seek the treatment directly from hospitals and specialized centers [7]. Given the proximate logistics and high patient visit rate of primary care clinics, utilizing these facilities can enhance OHCA survival. The study aims to describe GP’s prehospital

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resuscitation and investigate its contribution to OHCA outcomes in pilot regions of Kuwait.

METHODOLOGY

We used a cohort design that is appropriate to establish outcomes of GP's prehospital resuscitation of out of hospital cardiac arrest events in two large metropolitan provinces in Kuwait (Hawali province and Al Farwanya province) during the period of 10 months (21 February-31 December 2017).

Setting

There are 72 primary care clinics spread over the country, staffed with GPs, nurses and pharmacists. Primary care clinics are with in proximate logistics to people's homes [7]. When a patient in the primary care clinic is diagnosed with acute coronary syndrome or cardiac arrest, he/she is transported immediately to the regional hospital accident and emergency department (A&E). This is through GP activation of EMS dispatch unit and giving a patient diagnosis. In response, EMS call takers dispatch the nearest available ambulance to the primary care clinic and the EMS ambulance transports the OHCA patient to nearest regional hospital A&E.

Dispatch unit, Kuwait Emergency Medical Services, searched EMS archival data for OHCA patients that have been relocated from primary care clinics to regional hospital A&E department during the period; 21 February-31 December 2017, in Hawali and Al-Farwanya provinces. OHCA patient's data were then matched with Hospital records to obtain OHCA survival to 30 days.

EMS database routinely record information on involvement of GPs in OHCA resuscitation. The presence or absence of GP is determined by whether the EMS call was from a primary care clinic or not. If the OHCA occurred in the primary care clinic, a GP is assumed to be present and was recorded as "GP present". If the prehospital resuscitation was carried by EMS personal in other sites; home or public places, then GP absence is recorded as "GP not present". Patient demographics, response time, early CPR and defibrillation were compared between "GP present" and "GP not present" patient's groups. Where early CPR is defined as CPR immediately provided by bystander or health care provider as soon as the patients collapse.

Participants

We retrospective identified OHCA patients that activated primary care clinics and OHCA patients that activated Kuwait EMS directly and are transported to regional hospitals in Hawali province or Al-Farwanya province between the period of 21 February-31 December 2017. Patient demographics is a potential confounder, therefore it was included in the study analysis.

Eligibility criteria

Data of adults (>18 years) with OHCA of medical cardiac origin were included [8]. While OHCA of environmental origin including; drowning, trauma, intoxication and drug over dose were excluded. Reasons for excluding drowning, intoxication,

and drug overdose and traumatic cardiac arrest is the have low OHCA survival rates [9]. Moreover, OHCA patient report forms with rigor mortis, lividity and pronounced dead on scene were all excluded from the analysis.

Eligibility criteria for the "GP present" group

- Patients should experience cardiac arrest in primary care clinics of Hawali (13 clinics) or Al-Farwanya provinces (19 clinics) [7].
- Patients were transferred to hospital A&E from primary care clinic by EMS ambulance.
- Patient should be diagnosed as 'cardiac arrest' of medical cause on Patient Report Form (PRF), by on field EMS personals.
- PRF serial number should match EMS dispatch electronic record of cardiac arrest, cardiac related, respiratory-related or medical dispatch code.
- OHCA patient data match with hospital A&E nurse ledger.
- OHCA patients were relocated to Mubarak Al-Kabeer or Al-Farwanya Hospitals.

Eligibility criteria for "GP not present" group is

- A civilian activates Kuwait EMS dispatch unit from Hawali or Al-Farwanya provinces.
- Patient was at home or public place in Hawali or Al-Farwanya provinces.
- Patient should be diagnosed as 'cardiac arrest' of medical cause on Patient Report Form (PRF), by on field EMS personals.
- PRF serial number should match EMS dispatch electronic record of cardiac arrest, cardiac related, respiratory-related or medical dispatch code.
- OHCA patient data match with hospital A&E nurse ledger.
- OHCA patients were relocated to Mubarak Al-Kabeer or Al-Farwanya Hospitals.

Outcomes

Primary outcome, OHCA survival to 30 days and secondary outcome return of spontaneous circulation (ROSC).

Data source/Measurement

There are four data sources in this study; Dispatch unit electronic records, audit department archival data, Hospital nurse ledgers and Hospital medical records. Data for both patients group were collected from the same sources. Survival to 30 days is collected from Hospital records and ROSC is obtained from PRF.

Sample size

Targeted sample size was estimated (n=271) using population proportion formula. Given that current population in the study regions is 2,109,104 people and the power was=90%. Yet, the investigator recruited 314 participants to adjust for excluded OHCA patients of unknown identity.

Because OHCA cases are unpredictable, convenience sampling was used for the purposes of this study.

Statistical method

The statistical package for social sciences (SPSS), version 21 (IBM, New York, USA) was used for data entry and analysis. Pearson Chi-square test was used to compare categorical variables between the two groups; “GP present” and GP not present’.

Student t-test was used to compare continuous variables namely, response time and age. P-value more than 0.05 is considered significant.

RESULTS

During the ten-month study period, 601 OHCA cases from the Kuwait EMS archived data were extracted. Of these, 314 OHCA cases met the inclusion criteria and fell within the proposed study period. There were 287 cases excluded from the analysis due to; environmental causes, lividity and rigor mortis (Figure 1).

OHCA primary care clinic constituted (13%) of all OHCA events. When GP on scene, OHCA patients had higher survival to 30 days (7% versus 1%, p=0.029). However, in terms of prehospital ROSC, no significant difference was noted between the two groups. OHCA patients at the “GP present group” were more likely to be witness rate 55% (p ≤ 0.001), receive early CPR

48% (p ≤ 0.001) and defibrillation 4% (p ≤ 0.001). The comparison between groups’ OHCA patient’s demographics, resuscitation processes and clinical outcomes (Table 1).

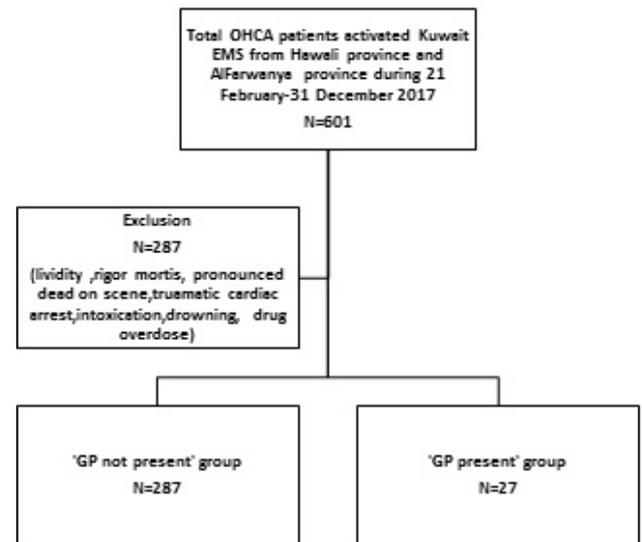


Figure 1: OHCA patients from Hawali and Al-Farwanya provinces during the period of 21 February-31 December 2017.

Table 1: OHCA patient demographics, resuscitation and clinical outcomes by group, using Chi-square test.

Variables	“GP present” patient group	“GP not present” patient group	OR (95%CI)	p Value
	N=27	N=287		
Dispatch Code				
Cardiac Arrest	5 (18.5)	27 (9.5)	0.001 (0.0-0.005)	< 0.001
Cardiac-related	6 (22)	5 (2)		
Respiratory-related	1 (4)	36 (12)		
Medical	15 (55)	216 (76)		
Age (mean in years)				
Gender				
Male	19 (70)	191 (67)	0.684 (0.82-0.97)	
Female	8 (30)	96 (33)		
Witnessed	15 (55)	33 (11.5)	0.001 (0.0-0.005)	< 0.001
Initial rhythm (%)				
Shockable	8 (33)	3 (1)		

Non-shockable	2 (8)	84 (31)	0.133 (0.31-0.38)	0.032
Unknown	14 (58)	178 (67)		
Response time (mean in minutes)	4.49	5		0.076
Early CPR*	13 (48)	25 (8.7)	0.001 (0.0-0.005)	< 0.001
Defibrillation	2 (4)	7 (2)	0.001 (0.0-0.005)	<0.001
ROSC*	2 (7)	8 (3)	0.254 (0.17-0.24)	0.191
Survival to 30 days	2 (7)	4 (1)	0.084 (0.82-0.87)	0.029

DISCUSSION

This is the first study to report national GP prehospital resuscitation contribution to OHCA survival to 30 days. Data suggests that OHCA of medical origin resuscitated by GPs have favourable survival to 30 days rates in pilot regions of Kuwait (7% versus 1%), Table 1.

The current study OHCA survival rates (7%) is comparable to Asian (5.8%) [10] but less than Western (17-32%) [6,11] countries.

Possible causes for “GP present” patients’ group better survival rate are; high shockable rhythms, early CPR and high witness rates.

Shockable rhythms are known to be associated with better OHCA outcomes [2,12]. “GP present” group high shockable rhythm 33% is best explained by the proximate logistic of primary clinics to people’s homes. “GP present” group patients were taken by their families to definitive care, primary care clinics, in which they were diagnosed and resuscitated directly by GPs leading to short time of patient-health professional contact, higher shockable rhythm rates and subsequently better survival. Renkiewicz et al. explained the probability of shockable rhythm increases as patient-health professional contact time decreases [12,13].

In terms of early CPR contribution to favourable “GP present” patients’ group survival, early CPR doubles OHCA survival rate [2].

Favourable witness rate is one more reason for the enhanced OHCA survival rates in “GP present” group patients. Witnessed OHCA’s are associated with better survival [14].

There was no significant difference in ROSC rates between the two patients’ groups. This is similar to the current literature; ROSC was less achievable in OHCA events resuscitated by registered GPs in Ireland [11].

A major strength of this study is that it presents comprehensive examination of GP prehospital resuscitation and its contribution to OHCA outcomes that is in line with current literature [3,10]. There are several limitations of the present study; first, high rates of witnessed shockable OHCA events alone (without GP involvement) can result better OHCA survival rates. Multivariate logistic analysis can show better

association between GP prehospital resuscitation and OHCA survival rates. Second, time intervals including; patient-health professional contact and EMS scene time were not evaluated to confirm GP prehospital resuscitation contribution to OHCA patients’ transfer. These data have not been evaluated by previous studies; therefore building GP prehospital resuscitation database can give additional details on GP prehospital resuscitation contribution to OHCA outcome and on scene management. Third, the sample was nationally representative of Kuwait but might be not transferable to the Middle East region. Middle East countries are heavily populated [15]. Fourth, the current sample size is relatively small. However, it is important to mention that it is within range of previous studies sample sizes on OHCA at primary clinic 138 [10] to 510 participants [11]. Fifth the level of GP training and defibrillator availability was not assessed. Finally, there may be more factors that affect survival in this group, which were not included in the analysis, such as post cardiac care; Targeted temperature management (TTM), Extracorporeal membrane oxygenation (ECMO).

CONCLUSION

In summary, General practitioner prehospital resuscitation can enhance OHCA survival to 30 days in regions of Kuwait. We propose expansion to other regions and building GP prehospital resuscitation database to improve OHCA survival.

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ETHICAL APPROVAL

Ethical approval was granted by the Ministry of Health, State of Kuwait on 26 August 2016 (No.448). No informed consent was sought from participants.

CONFLICT OF INTEREST

The author has no conflict of interest.

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